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Effectiveness of Pulse Dye Laser Versus No Treatment in the Treatment of Infantile Hemangiomas

Abstract

Background: Infantile hemangiomas are alarming to new parents and it is natural that their concerns are brought to the medical clinician. Educating the parents about the tumors and the anticipated growth process of the tumor is crucial. This educational opportunity needs to be covered prior to discussion treatment options. The treatment options are complex, for hemangiomas, but the focus of this article contrasts laser therapy and the no treatment option.

Methods: This article is a systematic review designed to examine the literature available and to determine if laser therapy is an effective treatment for infantile hemangiomas.

Hypothesis: Laser therapy has a greater number of positive treatment outcomes compared to no treatment.

Results: Six studies were reviewed on hemangioma therapy using a laser. Laser therapy was found to be helpful in reducing redness and surface area of superficial hemangiomas on all skin types.

Conclusion: If laser therapy is going to be used it should be started early in the hemangiomas appearance. Watchful waiting is usually the default option because the parents are not trained to recognize the hemangioma formation early in the growth staging. Laser therapy is most effective for superficial hemangiomas.

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Effectiveness of Pulse Dye Laser Versus No Treatment in the Treatment of Infantile Hemangiomas.

Ryan P. Kendrick



A Clinical Graduate Project Submitted to the Faculty of the
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Faculty Advisor: Annjanette Sommers MS, PAC
Clinical Graduate Project Coordinators: Rob Rosenow PharmD, OD & Annjanette Sommers MS, PAC

Biography

Ryan Kendrick grew up in Monument, Colorado and pursued what was the start of his higher education at the University of Northern Colorado. He earned his degree in Political Science with an emphasis in Legal Studies there. During his senior year he represented the university in the Model Arab League where he brought home two awards: military affairs and distinguished negotiations. His internship gave him an exposure to law enforcement through the Weld County Sheriff's Office. This internship gave him the opportunity to investigate crimes and to serve with a joint federal and state task force where the arrest was made on the TV show 'America's Most Wanted'. After graduation he attended the police academy and worked for the State of Colorado in the Division of Youth Corrections. Finding a new strength in himself as the facilities EMT-B and wanting to excel, he re-entered the academic community to earn pre-med credits. During this, time he continued to appreciate medicine while volunteering as a Lafayette Firefighter in Lafayette, Colorado. After seven years as a medic, he was selected as one of forty-two candidates from a pool of six-hundred and forty-one applicants to enter Physician Assistant School at Pacific University of Oregon. During his time at Pacific University of Oregon, he proudly supported his colleagues as their Vice President.

Abstract

Background: Infantile hemangiomas are alarming to new parents and it is natural that their concerns are brought to the medical clinician. Educating the parents about the tumors and the anticipated growth process of the tumor is crucial. This educational opportunity needs to be covered prior to discussion treatment options. The treatment options are complex, for hemangiomas, but the focus of this article contrasts laser therapy and the no treatment option.

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Keywords: Hemangioma, haemangioma, infancy, complications, skin, vascular malformations, angiogenesis, and markers, pulse dye laser, long-pulsed dye laser, laser.

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To Professor Gietzen, who not only taught me beyond my expectations but supported my family during times of hardship. Thank you.

List of abbreviations

LPDL	Long-pulse dye laser
TPDL=PDL.....	Traditional pulse dye laser
Nd:YAG.....	Neodymium:yttrium-aluminum-garnet
TRT.....	Thermal relaxation time
IH.....	Infantile Hemangiomas
FPDL.....	Flashlamp-Pumped Dye Laser

Effectiveness of Pulse Dye Laser in the Treatment of Infantile Hemangiomas.

Introduction

Vascular abnormalities are the most common neoplasm in the neonatal population. These tissue developments are seen in up to 12% of children in the first year of their lives.¹ The management of vascular developments is burdened by inconsistent nomenclature. Several types of classification systems have attempted to label vascular developments as biologic in nature, clinical, anatomic, pathologic, embryologic, or by the use of a general physical description.²⁻⁴

During the mid-nineteenth century histopathologic identification was based on size of the vessels. This type of systemized categorization, developed by Virchow, included angioma simplex, angioma cavernosum, and angioma racmosum.³ Additional classifications, based on pathologic, embryologic and lymphatic lesion were attempted but they were not successful.³ Edgerton, 1976, started the clinical classification of angiomas according to their history. He divided angiomas into the following categories: those that may be expected to resolve spontaneously, those that grow into adjacent structures, and those that did not change if left untreated. Although, the classification system could recognize the possibilities, no true biological identification system existed until 1982.² Mulliken and Glowacki defined the difference between vascular abnormalities as either, a hemangioma, or a malformation. These identifications were made based on clinical, and then histological findings. Today, both radiographic and biochemical approaches have supported their classifications as valid.⁵

Hemangiomas are lesions that are composed of excessive endothelial cell turnover. Most often these tumors are discovered visually during the first year of life and they start to grow quickly. During the next several years until the tissue involutes.⁴

Females have a greater occurrence of hemangiomas than males. With a 2-5 times higher rate.⁶⁻

⁸ The ratio is much more equal with congenital hemangiomas, vascular malformations, and

kaposiform hemangioendotheliomas in regards to gender.^{2, 8, 9, 10} The greatest number of hemangiomas are located in the cervicofacial area, 60%. (16) Up to 80% of the affected children have only one lesion, while the other 20% have more than one lesion.⁶

The occurrence of hemangiomas is random, and studies on dizygotic and monozygotic twins did not determine a genetic association.⁷ There have been reports of familial hemangiomas with a possible inheritance link.¹¹

Hemangiomas can be visceral, deep, or superficial in development. Superficial tumors are often crimson in color and can be referred to as strawberry hemangiomas. Tissue that is pale, purple, or blue is often confused with venous malformations.¹²

Appearance of the hemangiomas generally occurs in the second month of life. The tissue can be erythematous or telangiectasia, with a circumscribed faded ring. The expansive growth is present between 4 and 8 months after which the tissue stabilizes in size. Involution of the tumor can start around 12 months old and be identified by changes in color. As the color fades and the turgidity of the tissue can develop. Proliferation and involution of the hemangioma can occur simultaneously. The involution process can continue for up to 12 years of the child's life.^{3, 6} Fifty percent of the hemangiomas involute by 5 years; of the remaining 50%, 70% will be gone by age seven; usually the remainder will resolve gradual before age 12. The rate of involution does not seem to be influenced by the location of the hemangioma. There is no correlation between size, gender, ulceration, depth, and presentation and rate of resolution. An early involution is associated with an optimum outcome. After involution of the tumor occurs, loose skin or scarring may remain.⁶

Growth staging was identified in one study: 'Growth characteristics of Infantile Hemangiomas: Implications for Management', "based on global assessment that includes parental history, assessment of interval growth, and investigator assessment as follows: Nascent, referring to a premonitory mark; early proliferative, denoting the rapid proliferative phase late proliferative, reflecting, ongoing albeit less rapid growth; plateau phase, involution and abortive."¹³ This study gauged development in an

objective form. Based on this criterion, the patient was referred to a specialist, 76% of the time, with an average of 5 months since the initial discovery by the parent.¹³

Hemangiomas have a 2 month onset, are raised, and are benign. Diagnosis is often made by the history, biopsy, and imaging, including the use of doppler ultrasound. Doppler ultrasound, which is cost effective, and carries the lowest long-term threat to the infant's health, is preferred.²

Vascular malformations are the result of misguided morphogenesis that is divided into subcategories that include: combined forms, lymphatic, arterial, venous, and capillary. The combined forms occur widely. Low fluid flowing tumors include venous malformations, lymphatic, and capillary tumors. High fluid flowing tumors are associated with arteriovenous fistulas and arteriovenous malformations. These endothelium malformations are not hyperplastic and their cellular turnover rate is normal. The clinician will not be able to empty the blood supply with touch pressure. The tumors are not susceptible to antiproliferative treatments like chemotherapy, radiation, or antiangiogenic agents like interferon and corticosteroids.^{14, 15, 16} Female infants are affected by these tumors as often as male infants. The lesions are present at birth but may remain undetected until puberty. Vascular malformations are susceptible to the hormonal changes of pregnancy. Trauma or infection of the tissue could result in a period of rapid development. The most notable differences between hemangiomas and vascular malformations, is that malformation do not involute over time.^{3, 5}

Imaging such as magnetic resonance imaging, computerized tomography, and arteriography show that hemangiomas are highly distinguishable from other tumors. In 93% of cases, imaging was effective in defining: abnormal structures, assess treatment options, planning a surgery, and eliminating the concern for visceral attachment.^{12, 14-18} In the two studies between computer tomography and magnetic resonance imaging the finding are similar.¹⁵ A study supporting computer tomography in hemangioma identification is 'The Value of Three-Dimensional Computer Tomographic Angiography in the Diagnosis and Treatment of Vascular Lesions'. This study demonstrated the flaws in doppler ultrasound's ability to distinguish lesions from surrounding

structures. The study in 2006-2007 used 16 patients with ages ranging from 75 days to 55 years of age, the average age being 11.3 years. The study found that intervention is based on the diagnosis and that accuracy could come from computer tomography. It should be noted, that the imaging is expensive and there is a great deal of concern about radiation exposure in children.¹⁹

Treatment specific to this article include laser therapy. The laser uses light frequencies to enter the tissue of the tumor and coagulate the vessel in the tumor. The goal of laser therapy is to destroy the tumor tissue without harming the surrounding tissue. This procedure should cause the tumor tissue to involute more quickly.^{19, 20}

The flashlamp-pumped dye laser (FPDL) operates by selective photothermolysis. The energy emitted is selectively absorbed by the red blood cells in the form of heat. Coagulation occurs from thermal damage to the vessel. Heat is not transferred to adjacent dermal tissue because the laser energy is delivered in a pulse that lasts 450 microseconds. The rapid delivery rate of the FPDL ensures a low risk of scarring. The FPDL penetrates the first 1mm of the skin. This explains why superficial hemangiomas are more affected than mixed or deep hemangiomas.²¹

The FPDL delivers the energy beam through a thin fiber optic line connected to a hand-piece. The hand-piece contains an aiming beam and laser beam. The hand-piece is held perpendicular to the treatment site, with its stem adjacent to the aiming beam resting directly upon the skin.²¹

With this background a focus on the systematic treatment of pulse dye laser treatments versus no treatment for the infantile hemangiomas (IH) should become more understandable.

Review Design

An exhaustive search of available medical literature with an approach to understanding the subject was completed. Studies pertaining to specific findings were included but limited to studies that were available for analysis on the subject of laser therapy for infantile hemangiomas. This type of research did not have a need to eliminate patient bias as the patients were infants who could not mask physical changes during the treatment phase.

Purpose of study

This systematic review was done to evaluate the effectiveness of pulse dye laser versus no treatment in the treatment of infantile hemangiomas. There have been advances in the laser treatments during the last 50 years and evaluation of the progress, based on the available studies and research needed to be completed. In order to select a laser treatment the ratio of the most benefit verses the lowest complications needed to be discovered.²²

Significance

Hemangioma lesions are one of the most common findings in infants. There is a correlation with well child visits which focuses the cosmetic concern raised by the parents. Due to the appearance of the tumor the parents seek specific guidance to resolve their concerns. These benign tumors effect the families' social environment because they often grow on the child's face.²² In order to recommend a treatment that does not involve systemic medication or surgery the strengths and weakness of laser therapy would need to be explored. Selecting a treatment that is mildly painful, laser therapy, for a tumor that would most likely diminish in time becomes increasing challenging. This is why a study to measure which type of laser treatment would bring the most benefit was completed.²⁰

Methods and Materials

An extensive literature search was conducted, using the following search engines: Medline-Ovid, MD Consult, and CINAHL. Inclusion criteria: English, published since 1990, individuals with hemangiomas (or haemangiomas British English), various Fitzpatrick skin phototypes that included fair skin to dark skin, and laser treatment. The inclusion criterion for this study was: randomized studies, non-randomized, and infants. The exclusion criterion was applied to meta-analysis, steroids, life threatening, and articles published prior to 1990. All trials with a JADAD score of 2 or higher were used for this review due to the limited number of studies on various lasers. Systematic reviews included information from professional journals and the makers of the laser products. Articles from

1974-2007 were used to support the introduction and articles from 1990-2007 were used to evaluate laser therapy.

Results

In 1995 Levine, et al, discussed the possibilities of traditional pulse dye laser (TPDL) for reducing the symptoms of hemangiomas. The study continued to relate her findings to a series of experiments on 25 IH. Of the 25 patients, with IH, that were treated with TPDL 16% atrophied, 21% showed hyperpigmentation, and 10% showed hypopigmentation. Scarring was not appreciated on any of the patients. The laser was made by the Candela Corp of Wayland, MA and after 1988 the wavelength was tuned to 585nm which was 8nm of an increase. This higher energy level was specified for the depth of the IH. The patients were treated every 2-8 weeks until the results were favorable.²³

The additional study included 43 cases where IH were treated among 500 patients. The remaining patients had other skin disorders that were being treated with TPDL and the results were grouped in a manner to include all the adverse reactions together. It is not known how the 43 patients who received TPDL reacted but the author closes with a statement referring to the safety of the TPDL.²³

In Berlin, Germany a study by Poetke, et al, was conducted in 1996-1998, and published in 2000. It included 165 patients with 225 IH with a mean follow up of 5 months. The average age of the patient was 14 weeks old. The patients were divided into 3 groups. Group one contained 47 patients with 54 combined subcutaneous and deep tumors. The second group contained 100 patients with superficial hemangiomas. The third group contained 18 patients with 18 superficial hemangiomas that were in the involution stage. Of the 165 patients 85 had IH on the face or neck. Treatment with the TPDL was conducted approximately every 4 weeks until the results were achieved. Of the 165 patients 30 underwent general anesthesia because of the proximity to the eye.²⁴

The laser was used for 1-10 millionth of a second with a thermal relaxation time (TRT) of less time than the laser blast. After the laser treatment the patient's IH was dressed with panthenol ointment and a parent cleaned the area with providone-iodine at home. The patient was to have groomed nails or gloves on during the recovery period. This precaution was intended to reduce any physical trauma to the treated IH.²⁴

A rating of excellent was in correlation to a total reduction of the IH to a state consistent with the surrounding tissue. The rating of good was awarded if the lesion was reduced significantly and rating of failure was given if the lesion was unchanged. The Nd:YAG laser, TPDL, was used in coordination with ice cubes to increase the depth of the energy to 10mm.²⁴

Of the 165 patients, 65 superficial IH were gauged to be excellent while 107 superficial IH were gauged to be good. Of the 54 subcutaneous and deep IH 64% did not show any change in appearance. Overall the TPDL eliminated lesions in a remarkable manner with no scars noted.²⁴

In 2002, Batta, et al, published a one year randomized controlled study of pulsed dye (PDL) laser treatment on IH. The study included 121 infants ages 1-14 weeks with superficial hemangiomas. Infants were randomly assigned to PDL treatment (n=60) or observation (n=61). These infants were monitored for one year. Several assessments were made including residual signs, adverse reactions, and complications.²⁵

The PDL used was the Chromos 585 nm Venus flashlamp pulsed dye laser (SLS Biophile Dyfed, Wales UK) at a pulse duration of 0.45 ms, spot diameter of 3-5 mm and energy of 6.0-7.5 J/cm². Treatments were repeated every 4 weeks for a few seconds and without anesthesia. The patients were followed up at ages 3, 6, 9, and 12 months. At these visits photographs and measurements were taken under consistent conditions. Several measurements were taken including the height, size, and color of the hemangioma.²⁵

The objective of this study was to ascertain if the parents believed the hemangioma to be problematic. To omit bias, a panel of five independent parents, with 1 year old children themselves,

reviewed the photos of the studied children. Of the panel of parents three of them had children with hemangiomas and two did not. After viewing each photo the parent panel was asked their opinion on the question, “If your child had this hemangioma at the age of 1 year, how much of a problem would you consider it to be?”²⁵ These parents were unaware of which children received PDL or did not receive treatment, watchful-waiting.²⁵

Initially the surface areas of the hemangiomas did not differ significantly between the groups. However, the PDL children had a significantly reduced IH surface area after a few treatments. The median was 83mm² for the observation and 38 mm² for the laser treatment group, showed that the p=0.03 which is a significant improvement. This change was greater than half the improvement of the non-treated group.²⁵

After the year both the treated and untreated children both had IH heights that were not significantly different to one another. Redness was significantly reduced in the treatment group after one year. Yet the number of hemangiomas considered a problem at 1 year by the five parents did not significantly differ between the two groups either.²⁵

The study authored by Kono, et al, 2005, on uncomplicated hemangiomas, displayed the individual gains of the long-pulse dye laser (LPDL) in contrast to the traditional pulse dye laser (TPDL). The study was randomized for 52 patients between the ages of 1-3 months of age. Twenty-six were assigned to TPDL, model Photogenica V by Cynosure, and 26 were assigned to LPDL with cryospray cooling, model V-beam of Candela. The randomization of the patients was based on demography.²⁶

The findings are noted in the research as minimal residual signs after one year of age. Children who were treated with the TPDL had a greater residual sign by 11% when compared to the LPDL. When hypopigmentation was evaluated the TPDL had a higher finding by 19% compared to the LPDL. When treatment was started, in the proliferation phase, the LPDL treatment reduced the time of growing by 71 days compared to the TPDL.²⁶

In 2006 a study by Sang-Hyuk, et al, was published on the effectiveness of 595 nm pulsed dye lasers on dark skinned patients with hemangiomas. The study included thirty-seven patients with hemangiomas. There were 28 females and 9 males, equating to a 3.1:1.0 ratio. All patients had Fitzpatrick skin phototypes of III to V. The variable-pulse 595 nm PDL, V-beam, manufactured by Candela Corporation, Wayland, WA, were used. This long-pulsed dye laser was equipped with a built-in cooling spray that activates before each pulse for 30ms. Customized pulse duration (1.5-10 ms), energy 4.0-15.0J/cm² and spot size (7 or 10mm) occurred depending on the individuals lesions.²⁷

To assess the results preoperative and postoperative photographs were taken by a digital camera (DSC-F707, Sony, Japan). It was stated that a thorough means of photographic quality and consistency was used. Two independent examiners evaluated the photographs. The categorized clinical response scores included: 0 (poor) 25% or less improvement; 1 (fair), 26-50% improvement; 2 (good), 51-75% improvement, and 3 (excellent), 76% or more improvement.²⁷ (see graph 1)

The patients received an average of 6 treatment sessions. The average clinical response was 1.68. The clinical response for the females was 1.71 and the males were 1.56. The clinical response scores for superficial hemangioma was 1.98 and deep was 1.08.²⁷

Stier, et al, 2007, authored laser treatment with TPDL neodymium:yttrium-aluminum-garnet (Nd:YAG). The laser was developed to treat vascular tumors without creating a scar. The study included that avoiding thermal damage to the surrounding tissue is of great importance. The thermal relaxation time would need to be great enough that the surrounding tissue was not affected by the coagulation of the IH tissue. The TPDL exposure time of the surrounding tissue is believed to be responsible for the scar tissue that unfortunately was developing with treatment.²⁰

Stier, et al, continues to describe cooling systems that would be able to decrease the damage to surrounding tissue containing the targeted IH. Three cooling systems were developed. Precooling is where the surrounding tissue is cooled just prior to the laser therapy. Parallel cooling cools the skin

during the treatment where post-cooling reduces erythema and pain. These are supported by the cryogen spray cooling.²⁰

The traditional pulse dye laser does not use cooling elements on the tissue. This cooling system was included to reduce scarring of the surrounding tissue. The time of exposure, per blast of the laser is one millisecond followed by 1-10 millisecond thermal relaxation time (TRT). The TRT decreases the risk of heat conduction to the surrounding tissue.²⁰

The study explains how laser treatment is controversial because of the range of possible outcomes.²⁰ Included in the study was the *Journal of the American Academy of Dermatology* recommendations for the treatment of IH under the following conditions: 1) function threatening including life threatening, 2) locations that are likely to create a scar (glabellar area, nose, lip, ear), 3) large facial IH, 4) smaller exposed areas of the hands and face, 5) ulcerated IH, and 6) pedunculated IH that could leave fibrous tissue after involution.²⁸ Treatment, of some types, after 5 years of age is recommended to reduce the patient's peers from damaging the child's self awareness through teasing.²⁸

If treatment is selected or indicated TPD is best utilized on deep IH. Stier continues to point out that the TPD's were better suited for the treatment of port wine stains not IH. The vessels in IH are much closer to the surface of tissue making treatment with the TPD more challenging. When ulcerated IH are being treated TPD use is more acceptable because the nature of the ulceration or infection could cause scarring alone.²⁰

This study suggested that the newer, long-pulse dye laser (LPDL) is more effective on deeper IH but there still is a risk of scarring. The clinical recommendations made reflected that the laser systems addressing IH are not accurate enough to influence pediatric dermatologist to choose laser therapy over watchful waiting.²⁰

Discussion

In 1995, Levine, et al, the PDL treatment study for hemangiomas showed some promising outcomes but the lower number of patients studied was not able to give a well rounded conclusion.

This study stated that no scarring occurred. When compared to the other laser treatment studies they all had some form of complications including scarring. The absence of no scarring must not have developed at the completion of the study. This article did not give enough specific information to draw a conclusion but the background on the time period was valuable to support the more recent studies. The information was not able to show that watchful waiting was less productive in tumor resolution.²³

The 2000 study evaluated pre and post treatment photos and where treatment was determined to be ineffective on deep hemangiomas. Unfortunately, this finding contradicts the goal of the laser therapy, deeper penetration. No improvement with or without treatment in some of the cases reduces the ability to discover a cause and effect ratio.²⁴ There were significant changes in the tumor tissue on the superficial hemangiomas after the laser treatment. This shows that treat does reduce some of the symptoms of superficial IH.²⁴

The 2002 study was extremely thorough in recruiting patients. In one year 6000 mothers were educated on the appearance of hemangiomas. In fact the principal investigator personally checked 2000 babies in that year to help identify early hemangiomas. This enabled them to have such definitive cohort. All patients were observed in the initial stages of a hemangioma and its growth for the first year. The JADAD score for this study was a 5 indicated this study's quality.²⁵

In 2005 a new version of the laser treatment with cooling systems improved the outcome of the tissue. This finding was relevant because the proponents for watchful waiting focus on the scar that develops after treatment. With the cooling system the surrounding tissue is less affected by the heat of the laser therefore reducing scarring and causing IH reductions.²⁶

When examining the traditional pulse dye laser outcomes, 2007, it becomes increasingly obvious that the data is reflecting significant changes in the hemangioma that theoretically would not have occurred without any intervention. This finding is comforting considering the patient is experiencing mild to moderate discomfort with the treatments.²⁷

Limitations of Study

The limitations of the study are hindered by the scale of patient who had been monitored during laser treatments on IH. Many of the studies that were reviewed focused on the outcome of a certain number of patients that received treatment but the outcomes with laser therapy were generally a smaller tumor and reduced redness after the treatment. Subjective judgment by the parent is the true gauge of treatment outcome. The study that compared the laser therapy to non-treated patients revealed results that were better in tumor resolution measurement wise but the parental observers did not agree with the resolution done by photo grading. This means that with a year of monthly laser treatments the subjective grading of the laser treated tumors versus the non-treated tumors was equal, in the parent's opinion. Some of the other articles pointed out that the risk of complications in pulse dye laser therapy were close to the benefits gained by the treatment. These findings displayed a clinical benefit from the pulse dye laser but the outcome was not as valuable to the parent. One limitation of the study was the location of the treated IH prior to the parent grading. It would be acceptable for a treated IH in the middle of the face to get an unacceptable grade while an IH on the back of the ear to receive an acceptable grade. Improvement of a tumors appearance seems to be graded more severely than the scientific method of measuring and comparing before and after color tones.

Conclusion

Treatment decisions should be made by a specialist with the parent's informed consent. Doing no treatment is a valid option as well. The severity of the hemangioma is the most influential fact when choosing a treatment. The literature is relatively new, yet no real developments in total laser treatment are taking the lead in popularity.

A diagnosis through computer topography is generally unacceptable because of the radiation exposure associated with the imaging. This imaging seems to be the point at which diagnosis and

treatment are linked, but few clinicians would expose an infant to radiation in order to identify a benign tumor which could improve with watchful waiting.

In reference to the laser treatment that would carry the least amount of risk with the greatest benefit the Long-pulsed laser with a cryocooling system is at the forefront of technology today. Considering some dermatologist would prefer to wait-and-see verses start aggressive laser therapy really limits the aspect of further large numbered studies. As lasers are used in other medical capacities and it can only be assumed that a laser therapy designed for hemangioma resolution will be engineered.

The research on this subject did show a treatment benefit to laser therapy but there continues to be an associated risk of complications that the family of the patient would probably like to avoid. Until these complications are reduced laser therapy will continue to be a distant choice for treatment behind medication treatments or no treatment.

Collectively these studies showed that some form of benefit occurred after laser therapy but the risk to benefit ratio was not significantly high enough to grossly recommend laser therapy as an alternative to watchful waiting. Watchful waiting is the standard at this time but if the family is persistently seeking a reduction in the infantile hemangiomas laser therapy is an option.

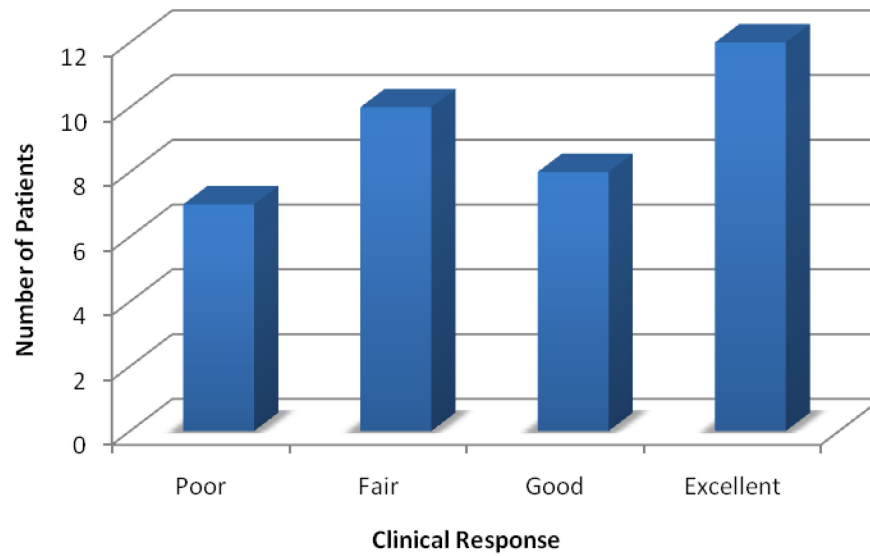
Overall, case by case options are the most accurate way to approach the treatment for the most common benign tumor, the infantile hemangioma.

Tables and Graphs

Table 1: Outcomes of the Randomized controlled study of early pulsed dye laser treatment of uncomplicated childhood hemangiomas.²⁵

Outcome	PDL (n=60)	Observation (n=61)	P
Height (mm)			
0	33	31	0.61
1-2	12	11	
3-5	6	11	
6-10	5	6	
>10	3	2	
Surface area (median, range)	113 (0-1500)	146 (0-2406)	0.21
Redness			
None	19	4	
Mild	16	23	
Moderate	20	18	
Pronounced	5	16	
Average hemangioma problem grading of five independent parents			
Not at all	42	40	0.82
A bit	8	10	
Quite a bit	5	9	
A lot	1	1	
A big problem	4	1	

**Graph 1: Treatment of Hemangiomas
with Variable Pulse 595 nm Pulsed
Dye Laser**



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Table 2: Results of Reviewed Articles

JADAD Score	Study	Published	Study Type	Sample Size	Comparison	Results
2	Adverse effects associated with the 577 and 585-nanometer pulsed dye laser in the treatment of cutaneous vascular lesions: A study of 500 patient	1995	Case study	500	Outcome of the hemangioma	Pulse Dye Laser is safe in the treatment of vascular lesions
2	Flashlamp-Pumped Pulsed Dye Laser for Hemangiomas in Infancy	2000	Nonrandomized control trial	165	Superficial and mixed hemangiomas and no treatment	34% had excellent results and 52% had good results
5	Randomised controlled study of early pulsed dye laser treatment of uncomplicated childhood haemangiomas: results of a 1-year analysis	2002	Randomized controlled study	121	Pulse dye lasers compared to wait-and-see policy	No significant benefit to Pulse Dye Laser
4	Comparison Study of Traditional Pulsed Dye Laser Versus a Long-Pulsed Dye Laser in the treatment of Early Childhood Hemangiomas	2005	Randomized controlled study	52	Pulse dye laser compared to long-pulse dye laser	Long-pulse dye laser had more patient with an excellent rating and less than half the complications
3	Treatment of Vascular Skin Lesions with the Variable Pulse 595nm Pulsed Dye Laser	2006	Case study of the type of vascular formations.	37	Pulse Dye Laser treatment outcomes	32% had excellent ratings and 22% had good ratings.
2	Laser treatment of pediatric vascular lesions: Port wine stain and hemangiomas	2008	Case Study	Undetermined	Pulse dye laser risk to benefit reflection	Currently there are no adequate laser systems for hemangioma treatment

Table 3: PICO

Population: Patients with facial or neck hemangiomas.

Intervention: Laser therapy.

Comparison: No treatment for infantile hemangiomas.

Outcome: Involution of the tumor and resolution of the tissue.

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